

## SEQUENCE LISTING

<110> Sturmer, Rainer  
Kessler, Maria  
Hauer, Bernhard  
Friedrich, Thomas  
Breuer, Michael

<120> Methods for the production of  
3-methylamino-1-(thiene-2-yl)-propane-1-ol

<130> 13111-00035-US

<150> PCT/EP2004/010939

<151> 2004-09-30

<150> DE 103 45 772.0

<151> 2003-10-01

<160> 44

<170> PatentIn version 3.3

<210> 1

<211> 47

<212> PRT

<213> Lactobacillus brevis

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Met Ser Asn Arg Leu Asp Gly Lys Val Ala Ile Val Thr Gly Gly Thr  
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Leu Gly Ile Gly Leu Ala Ile Ala Thr Lys Phe Val Glu Glu Gly Ala  
20 25 30

Lys Val Met Ile Thr Gly Arg His Ser Asp Val Gly Glu Lys Ala  
35 40 45

<210> 2

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<213> Candida magnoliae

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Ser Asn Ala Leu Val Thr Gly Gly Ser Arg Val Ile Gly Ala Gly Gly  
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Phe Ile

<210> 3

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<212> DNA

<213> Lactobacillus brevis

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<222> (1)..(756)

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| Met Ser Asn Arg Leu Asp Gly Lys Val Ala Ile Val Thr Gly Gly Thr |     |
| 1 5 10 15                                                       |     |
| ttg ggt atc ggt tta gct atc gcc acg aag ttc gtt gaa gaa ggg gct | 96  |
| Leu Gly Ile Gly Leu Ala Ile Ala Thr Lys Phe Val Glu Glu Gly Ala |     |
| 20 25 30                                                        |     |
| aag gtc atg att acc ggc cgg cac agc gat gtt ggt gaa aaa gca gct | 144 |
| Lys Val Met Ile Thr Gly Arg His Ser Asp Val Gly Glu Lys Ala Ala |     |
| 35 40 45                                                        |     |
| aag agt gtc ggc act cct gat cag att caa ttt ttc caa cat gat tct | 192 |
| Lys Ser Val Gly Thr Pro Asp Gln Ile Gln Phe Phe Gln His Asp Ser |     |
| 50 55 60                                                        |     |
| tcc gat gaa gac ggc tgg acg aaa tta ttc gat gca acg gaa aaa gcc | 240 |
| Ser Asp Glu Asp Gly Trp Thr Lys Leu Phe Asp Ala Thr Glu Lys Ala |     |
| 65 70 75 80                                                     |     |
| ttt ggc cca gtt tct aca tta gtt aat aac gct ggg atc gcg gtt aac | 288 |
| Phe Gly Pro Val Ser Thr Leu Val Asn Asn Ala Gly Ile Ala Val Asn |     |
| 85 90 95                                                        |     |
| aag agt gtc gaa gaa acc acg act gct gaa tgg cgt aaa cta tta gcc | 336 |
| Lys Ser Val Glu Glu Thr Thr Thr Ala Glu Trp Arg Lys Leu Leu Ala |     |
| 100 105 110                                                     |     |
| gtc aac ctt gat ggt gtc ttc ttc ggt acc cga tta ggg att caa cgg | 384 |
| Val Asn Leu Asp Gly Val Phe Phe Gly Thr Arg Leu Gly Ile Gln Arg |     |
| 115 120 125                                                     |     |
| atg aag aac aaa ggc tta ggg gct tcc atc atc aac atg tct tcg atc | 432 |
| Met Lys Asn Lys Gly Leu Gly Ala Ser Ile Ile Asn Met Ser Ser Ile |     |
| 130 135 140                                                     |     |
| gaa ggc ttt gtg ggt gat cct agc tta ggg gct tac aac gca tct aaa | 480 |

Glu Gly Phe Val Gly Asp Pro Ser Leu Gly Ala Tyr Asn Ala Ser Lys  
 145 150 155 160  
 ggg gcc gta cgg att atg tcc aag tca gct gcc tta gat tgt gcc cta 528  
 Gly Ala Val Arg Ile Met Ser Lys Ser Ala Ala Leu Asp Cys Ala Leu  
 165 170 175  
 aag gac tac gat gtt cgg gta aac act gtt cac cct ggc tac atc aag 576  
 Lys Asp Tyr Asp Val Arg Val Asn Thr Val His Pro Gly Tyr Ile Lys  
 180 185 190  
 aca cca ttg gtt gat gac cta cca ggg gcc gaa gaa gcg atg tca caa 624  
 Thr Pro Leu Val Asp Asp Leu Pro Gly Ala Glu Glu Ala Met Ser Gln  
 195 200 205  
 cgg acc aag acg cca atg ggc cat atc ggt gaa cct aac gat att gcc 672  
 Arg Thr Lys Thr Pro Met Gly His Ile Gly Glu Pro Asn Asp Ile Ala  
 210 215 220  
 tac atc tgt gtt tac ttg gct tct aac gaa tct aaa ttt gca acg ggt 720  
 Tyr Ile Cys Val Tyr Leu Ala Ser Asn Glu Ser Lys Phe Ala Thr Gly  
 225 230 235 240  
 tct gaa ttt gta gtt gac ggt ggc tac act gct caa 756  
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<212> PRT

<213> Lactobacillus brevis

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 Leu Gly Ile Gly Leu Ala Ile Ala Thr Lys Phe Val Glu Glu Gly Ala  
 20 25 30  
 Lys Val Met Ile Thr Gly Arg His Ser Asp Val Gly Glu Lys Ala Ala  
 35 40 45  
 Lys Ser Val Gly Thr Pro Asp Gln Ile Gln Phe Phe Gln His Asp Ser  
 50 55 60  
 Ser Asp Glu Asp Gly Trp Thr Lys Leu Phe Asp Ala Thr Glu Lys Ala  
 65 70 75 80  
 Phe Gly Pro Val Ser Thr Leu Val Asn Asn Ala Gly Ile Ala Val Asn

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |  |  |
| Lys | Ser | Val | Glu | Glu | Thr | Thr | Thr | Ala | Glu | Trp | Arg | Lys | Leu | Leu | Ala |  |  |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |  |  |
| Val | Asn | Leu | Asp | Gly | Val | Phe | Phe | Gly | Thr | Arg | Leu | Gly | Ile | Gln | Arg |  |  |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |  |
| Met | Lys | Asn | Lys | Gly | Leu | Gly | Ala | Ser | Ile | Ile | Asn | Met | Ser | Ser | Ile |  |  |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |  |
| Glu | Gly | Phe | Val | Gly | Asp | Pro | Ser | Leu | Gly | Ala | Tyr | Asn | Ala | Ser | Lys |  |  |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |  |  |
| Gly | Ala | Val | Arg | Ile | Met | Ser | Lys | Ser | Ala | Ala | Leu | Asp | Cys | Ala | Leu |  |  |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |  |
| Lys | Asp | Tyr | Asp | Val | Arg | Val | Asn | Thr | Val | His | Pro | Gly | Tyr | Ile | Lys |  |  |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |  |
| Thr | Pro | Leu | Val | Asp | Asp | Leu | Pro | Gly | Ala | Glu | Glu | Ala | Met | Ser | Gln |  |  |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |  |
| Arg | Thr | Lys | Thr | Pro | Met | Gly | His | Ile | Gly | Glu | Pro | Asn | Asp | Ile | Ala |  |  |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |  |
| Tyr | Ile | Cys | Val | Tyr | Leu | Ala | Ser | Asn | Glu | Ser | Lys | Phe | Ala | Thr | Gly |  |  |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |  |
| Ser | Glu | Phe | Val | Val | Asp | Gly | Gly | Tyr | Thr | Ala | Gln |     |     |     |     |  |  |
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<213> Candida magnoliae

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 Asn Ala Leu Val Thr Gly Gly Ser Arg Gly Ile Gly Glu Ala Thr Ala  
 1 5 10 15  
 att aag ctc gcc gag gag ggc tac agc gtc acg att gcg tct cgc ggc 96  
 Ile Lys Leu Ala Glu Glu Gly Tyr Ser Val Thr Ile Ala Ser Arg Gly  
 20 25 30  
 ctt aag cag ctc gag gct gtg aag gcc aaa cta ccc att gtg aag cag 144  
 Leu Lys Gln Leu Glu Ala Val Lys Ala Lys Leu Pro Ile Val Lys Gln  
 35 40 45  
 gga cag gtt cac cac gtg tgg cag ctt gat ctc agt gat gtc gac gct 192  
 Gly Gln Val His His Val Trp Gln Leu Asp Leu Ser Asp Val Asp Ala  
 50 55 60  
 gcg gcc gcc ttc aaa ggg tcg ccg cta cct gcc agc cgc tac gac gtg 240  
 Ala Ala Ala Phe Lys Gly Ser Pro Leu Pro Ala Ser Arg Tyr Asp Val  
 65 70 75 80  
 ctc gtc agc aat gct ggc gtg gcc cag ttt agc ccg ttc atc gag cat 288  
 Leu Val Ser Asn Ala Gly Val Ala Gln Phe Ser Pro Phe Ile Glu His  
 85 90 95  
 gcg aag cag gac tgg tcg cag atg ctt gcc atc aat ctg gcg gca ccc 336  
 Ala Lys Gln Asp Trp Ser Gln Met Leu Ala Ile Asn Leu Ala Ala Pro  
 100 105 110  
 att gcg ctg gcc cag aca ttt gct aag gcc att ggc gac aag ccg cgc 384  
 Ile Ala Leu Ala Gln Thr Phe Ala Lys Ala Ile Gly Asp Lys Pro Arg  
 115 120 125  
 aac aca ccg gcc cac att gtg ttt gtc tcg tcg aac gtc tcg ttg cga 432  
 Asn Thr Pro Ala His Ile Val Phe Val Ser Ser Asn Val Ser Leu Arg  
 130 135 140  
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<213> *Candida magnoliae*

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Asn Ala Leu Val Thr Gly Gly Ser Arg Gly Ile Gly Glu Ala Thr Ala  
 1 5 10 15  
 Ile Lys Leu Ala Glu Glu Gly Tyr Ser Val Thr Ile Ala Ser Arg Gly  
 20 25 30

Leu Lys Gln Leu Glu Ala Val Lys Ala Lys Leu Pro Ile Val Lys Gln  
 35 40 45

Gly Gln Val His His Val Trp Gln Leu Asp Leu Ser Asp Val Asp Ala  
 50 55 60

Ala Ala Ala Phe Lys Gly Ser Pro Leu Pro Ala Ser Arg Tyr Asp Val  
 65 70 75 80

Leu Val Ser Asn Ala Gly Val Ala Gln Phe Ser Pro Phe Ile Glu His  
 85 90 95

Ala Lys Gln Asp Trp Ser Gln Met Leu Ala Ile Asn Leu Ala Ala Pro  
 100 105 110

Ile Ala Leu Ala Gln Thr Phe Ala Lys Ala Ile Gly Asp Lys Pro Arg  
 115 120 125

Asn Thr Pro Ala His Ile Val Phe Val Ser Ser Asn Val Ser Leu Arg  
 130 135 140

Gly Phe Pro Asn Ile Gly Val Asn Ser Ile Thr Pro Gly  
 145 150 155

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 <212> DNA  
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 <223> Primer: Mke 338

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 gggaattcca tatgtctaac cgtttgg

27

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acgacgacga gcaacgcbct bgtbacgg

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<223> Primer: Mke 367

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acgacgacgt cgaacgcbct bgtbacgg

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gccgggggttg atsswggttsa cgccgat

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1

5

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Ala Ala

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Ile Gly Val Asn Ser Ile Asn Pro Gly  
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Ser Asn Arg Leu Asp Gly Lys Val Ala Ile Val Thr Gly Gly Thr Leu  
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Gly Ile Gly Leu Ala Ile Ala Thr Lys Phe Val Glu Glu Gly Ala Lys  
 20 25 30

Val Met Ile Thr Gly Arg His Ser Asp Val Gly Glu Lys Ala Ala Lys  
 35 40 45

Ser Val Gly Thr Pro Asp Gln Ile Gln Phe Phe Xaa  
 50 55 60

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Arg Arg Xaa Xaa  
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Ser Val Glu Glu Thr Thr Thr Ala Glu Trp Arg Xaa Xaa Xaa Xaa  
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Asp Glu Asp Gly  
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<400> 19

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| Val | Asn | Thr | Val | His | Pro | Gly | Tyr | Xaa | Lys | Xaa | Xaa | Xaa | Xaa | Xaa |
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Val Asn Thr Val  
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Ala Phe Ile Pro Gly Lys Arg  
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 1 5 10 15

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Ser Ala Ala Leu Asp Xaa Ala Leu Lys Asp Tyr Xaa Val Arg Xaa Xaa  
 1 5 10 15

Xaa Xaa

<210> 24  
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 1 5 10 15

Xaa

<210> 25  
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Lys Leu Leu Ala Val Asn Leu Asp Gly Val Phe Phe Gly Thr Arg Xaa  
 1 5 10 15

Xaa Xaa Xaa Xaa  
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<210> 26  
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Xaa Met Xaa Thr Gly Arg  
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<210> 27  
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<220>  
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<220>  
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<220>  
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<220>  
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<220>  
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<220>  
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 <222> (13)..(13)  
 <223> Amino acid is unreadable, Val, or Tyr  
  
 <220>  
 <221> VARIANT  
 <222> (14)..(14)  
 <223> Amino acid is Ile, Arg, or Thr  
  
 <220>  
 <221> VARIANT  
 <222> (15)..(15)  
 <223> Amino acid is Ala or unreadable  
  
 <400> 27

Thr Lys Thr Pro Met Gly His Ile Xaa Glu Pro Asn Xaa Ile Ala  
 1                      5                      10                      15

<210> 28  
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 <213> Lactobacillus brevis

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<220>  
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 <220>  
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 <222> (15)..(15)  
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<220>  
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 <223> Xaa is unreadable

<400> 28

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Lys | Thr | Pro | Met | Gly | Xaa | Ile | Ala | Glu | Pro | Asn | Asp | Ile | Ala | Tyr |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |
|-----|-----|-----|-----|
| Xaa | Xaa | Xaa | Xaa |
|     |     |     | 20  |

<210> 29  
 <211> 25  
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 <213> Lactobacillus brevis

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 <223> Amino acid is Ala or Gly

<220>  
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 <223> Amino acid is Ala or Leu

<220>  
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 <223> Amino acid is Lys or Phe

<220>  
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 <222> (5)..(5)  
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<220>  
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 <223> Amino acid is Gly or Val

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<220>

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<220>  
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<220>  
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<223> Amino acid is Gln, Ala, or Glu

<220>  
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<223> Amino acid is Ile or Thr

<220>  
<221> VARIANT  
<222> (13)..(13)  
<223> Amino acid is Gln or Val

<220>  
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<223> Amino acid is Phe or Pro

<220>  
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<222> (16)..(16)  
<223> Amino acid is Gln or Gly

<220>  
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<222> (17)..(17)  
<223> Amino acid is His or Tyr

<220>  
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<223> Amino acid is Asp or Ile

<220>  
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<220>  
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<222> (20)..(20)  
<223> Amino acid is Ser or Ala

<220>  
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<220>

<221> VARIANT  
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 <223> Amino acid is Val (unsure) or Ala

<220>  
 <221> VARIANT  
 <222> (24)..(24)  
 <223> Amino acid is Val (unsure) or Asn

<220>  
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 <222> (25)..(25)

<400> 29

Lys Ala Ala Lys Ser Val Gly Thr Pro Asp Gln Ile Gln Phe Phe Gln  
 1 5 10 15

His Asp Ser Ser Pro Glu Val Val Gln  
 20 25

<210> 30  
 <211> 20  
 <212> PRT  
 <213> Lactobacillus brevis

<220>  
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<220>  
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<220>  
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 <222> (5)..(5)  
 <223> Amino acid is Leu or Ala

<220>  
 <221> VARIANT  
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 <223> Amino acid is unreadable, Ile, or Asp

<220>  
 <221> misc\_feature  
 <222> (11)..(20)  
 <223> Xaa is unreadable

<400> 30

Xaa Val Lys Leu Leu Ala Val Asn Leu Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
 1 5 10 15

Xaa Xaa Xaa Xaa  
20

<210> 31  
<211> 20  
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<213> Lactobacillus brevis

<220>  
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<220>  
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<223> Amino acid is Phe or Val

<220>  
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<222> (4)..(4)  
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<220>  
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<220>  
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<220>  
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<220>  
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<223> Amino acid is Gln or Pro

<220>  
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<220>  
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<223> Amino acid is Ile or Tyr

<220>  
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<220>  
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<220>  
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<220>  
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 <223> Amino acid is Asn or Pro

<220>  
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<220>  
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<220>  
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<400> 31

Thr Val Phe Phe Gly Leu Lys Gln Asn Ile Glu Asn Ile Asn Ile Ala  
 1 5 10 15

Ala Val Arg Pro  
 20

<210> 32  
 <211> 30  
 <212> PRT  
 <213> Lactobacillus brevis



<220>  
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<220>  
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<223> Amino acid is Phe, Val, or Ser

<220>  
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<223> Amino acid is Val or Leu

<220>  
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<223> Amino acid is Asp, Ala, or Ile

<220>  
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<220>  
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<220>  
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<220>  
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<220>  
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<220>  
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<220>  
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 <222> (29)..(30)  
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<400> 32

Gly Phe Val Gly Asp Pro Ser Leu Gly Ala Tyr Asn Ala Gly Lys Gly  
 1 5 10 15

Ala Val Arg Ile Met Ser Lys Ser Ala Ala Leu Asp Xaa Xaa  
 20 25 30

<210> 33  
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 <212> PRT  
 <213> Lactobacillus brevis

<220>  
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 <222> (5)..(10)  
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 <400> 33

Phe Val Val Asp Xaa Xaa Xaa Xaa Xaa Xaa  
 1                      5                      10

<210> 34  
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<220>  
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<220>  
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<220>  
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<220>  
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 <223> Amino acid is Asp or Glu

<220>  
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 <223> Amino acid is Ala or Asp

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<220>  
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 <222> (13)..(20)  
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<400> 34

Asp Gly Xaa Thr Lys Leu Phe Asp Ala Thr Glu Glu Xaa Xaa Xaa Xaa  
 1 5 10 15

Xaa Xaa Xaa Xaa  
 20

<210> 35  
 <211> 14  
 <212> PRT  
 <213> Lactobacillus brevis

<220>  
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<400> 35

Phe Val Val Asp Gly Gly Tyr Thr Ala Gln Xaa Xaa Xaa Xaa  
 1 5 10

<210> 36  
 <211> 30  
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<220>  
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<220>  
 <221> VARIANT  
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<400> 36

Xaa Ala Leu Lys Asp Tyr Asp Val Arg Val Asn Thr Val His Pro Gly  
 1 5 10 15

Tyr Ile Lys Thr Pro Leu Val Val Asp Leu Pro Gly Ala Glu  
 20 25 30

<210> 37  
 <211> 15  
 <212> PRT  
 <213> Lactobacillus brevis

<400> 37

Lys Ala Ala Lys Ser Val Gly Thr Pro Asp Gln Ile Gln Phe Phe  
 1 5 10 15

<210> 38  
 <211> 13  
 <212> PRT  
 <213> Lactobacillus brevis

<400> 38

Gly Ala Lys Val Met Ile Thr Gly Arg His Ser Asp Val  
 1 5 10

<210> 39  
 <211> 10  
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<220>  
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<220>  
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<220>

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<400> 39

Ser Lys Phe Ala Thr Gly Ser Glu Phe Val

1

5

10

<210> 40

<211> 25

<212> PRT

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<220>

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<220>

<221> VARIANT

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<223> Amino acid is Val, Phe, or Leu

<220>

<221> VARIANT

<222> (4)..(4)

<223> Amino acid is Arg, Lys, or Gly

<220>

<221> VARIANT

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<220>

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<220>

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<220>

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<220>

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<220>  
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Xaa Asp Val Arg Val Asn Thr Val His Pro Gly Tyr Ile Lys Thr Pro  
 1 5 10 15

Leu Val Asp Asp Leu Pro Gly Ala Glu  
 20 25

<210> 41  
 <211> 40  
 <212> PRT  
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<220>  
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<220>  
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<220>  
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<400> 41

Trp Xaa Lys Leu Leu Ala Val Asn Leu Asp Gly Val Phe Phe Gly Thr  
 1 5 10 15

Arg Leu Gly Ile Gln Arg Met Lys Asn Lys Gly Leu Gly Ala Ser Ile  
 20 25 30

Ile Asn Met Ser Ser Ile Xaa Xaa  
 35 40

<210> 42  
 <211> 40  
 <212> PRT  
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<223> Amino acid is Gln, Leu, Lys, or Glu  
  
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<223> Amino acid is Pro or Leu  
  
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<220>  
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<220>  
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 <223> Amino acid is Glu or Gly

<220>  
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<220>  
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<220>  
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<220>  
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<220>  
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 <223> Amino acid is Ala or Ile

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 <223> Amino acid is Tyr or Gln

<220>  
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 <223> Amino acid is Tyr or Asn

<220>  
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<220>  
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 <223> Xaa is unknown

<400> 42

Ala Met Ser Gln Arg Thr Lys Thr Pro Met Gly His Ile Gly Glu Pro  
 1 5 10 15

Asn Asp Ile Ala Tyr Arg Met Lys Tyr Lys Ala Leu Gly Ala Ser Ile

20

25

30

Ile Asn Met Ser Xaa Xaa Xaa Gly  
 35 40

<210> 43  
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 <212> PRT  
 <213> Lactobacillus brevis

<220>  
 <221> misc\_feature  
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<400> 43

Ser Lys Phe Ala Thr Gly Ser Glu Phe Val Val Xaa Xaa Xaa Xaa  
 1 5 10 15

<210> 44  
 <211> 15  
 <212> PRT  
 <213> Lactobacillus brevis

<220>  
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<220>  
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 <223> Amino acid is Ser or Gln

<220>  
 <221> VARIANT  
 <222> (8)..(8)  
 <223> Amino acid is Glu or Ile

<220>  
 <221> VARIANT  
 <222> (9)..(9)  
 <223> Amino acid is Phe or Gln

<220>  
 <221> VARIANT  
 <222> (11)..(11)  
 <223> Amino acid is Val, Leu, or Ser

<220>  
 <221> VARIANT  
 <222> (12)..(12)  
 <223> Amino acid is Asp, Gln, or Lys

<220>  
 <221> misc\_feature  
 <222> (13)..(15)  
 <223> Xaa is unreadable

<400> 44

Ser Lys Phe Ala Thr Gly Ser Glu Phe Val Val Asp Xaa Xaa Xaa  
 1 5 10 15